

# GOES-R Atmospheric Motion Vectors (AMVs) Future Use in the NCEP Global Forecast System

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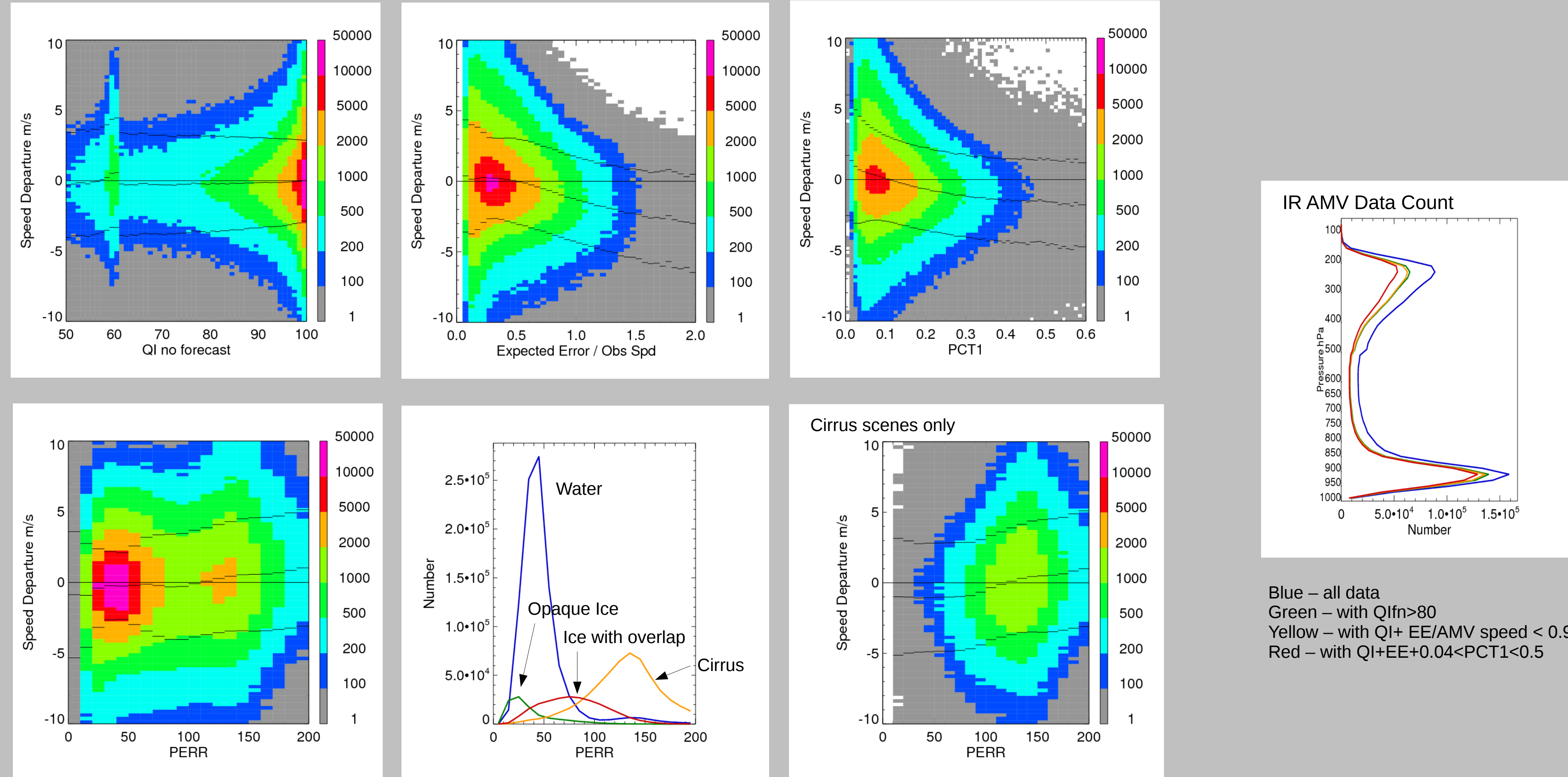
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## Quality Control

Parameters which were selected for quality control include Quality Indicator (QI, Holmlund 1998, top left), a normalized Expected Error (EE, Le Marshall et al. 2004, top center), as well as the nested tracking parameter PCT1 which is a measure of the standard deviation of the tracked cluster / distance the cluster traveled (top right). The top panels show the density plot of these parameter versus the AMV – GFS background speed for all IR AMV data in June 2012. The impact of the three quality control settings on the data count is shown as a function of pressure (far right). An estimate of the uncertainty of the cluster height in hPa (PERR) was not selected for quality control (bottom panels). PERR is a dependent on the cluster cloud type dominant in the scene (bottom center) and setting a maximum threshold value would mostly impact cirrus. The density plot for cirrus AMV scenes versus speed departure does show a speed departure dependence on PERR but the fast bias at large values of PERR is of the same magnitude as the slow bias at small values of PERR which should indicate a more accurate measure of the cluster height.



Holmlund, K. 1998. The utilization of statistical properties of satellite-derived atmospheric motion vectors to derive quality indicators. *Wea. Forecasting* **13**,1093–1105.  
Le Marshall, J., Rea, A., Leslie, L., Seecamp, R. and Dunn, M. 2004. Error Characterization of Atmospheric Motion Vectors. *Aust. Met. Mag.*, **53**, 123 – 131.

## Methodology

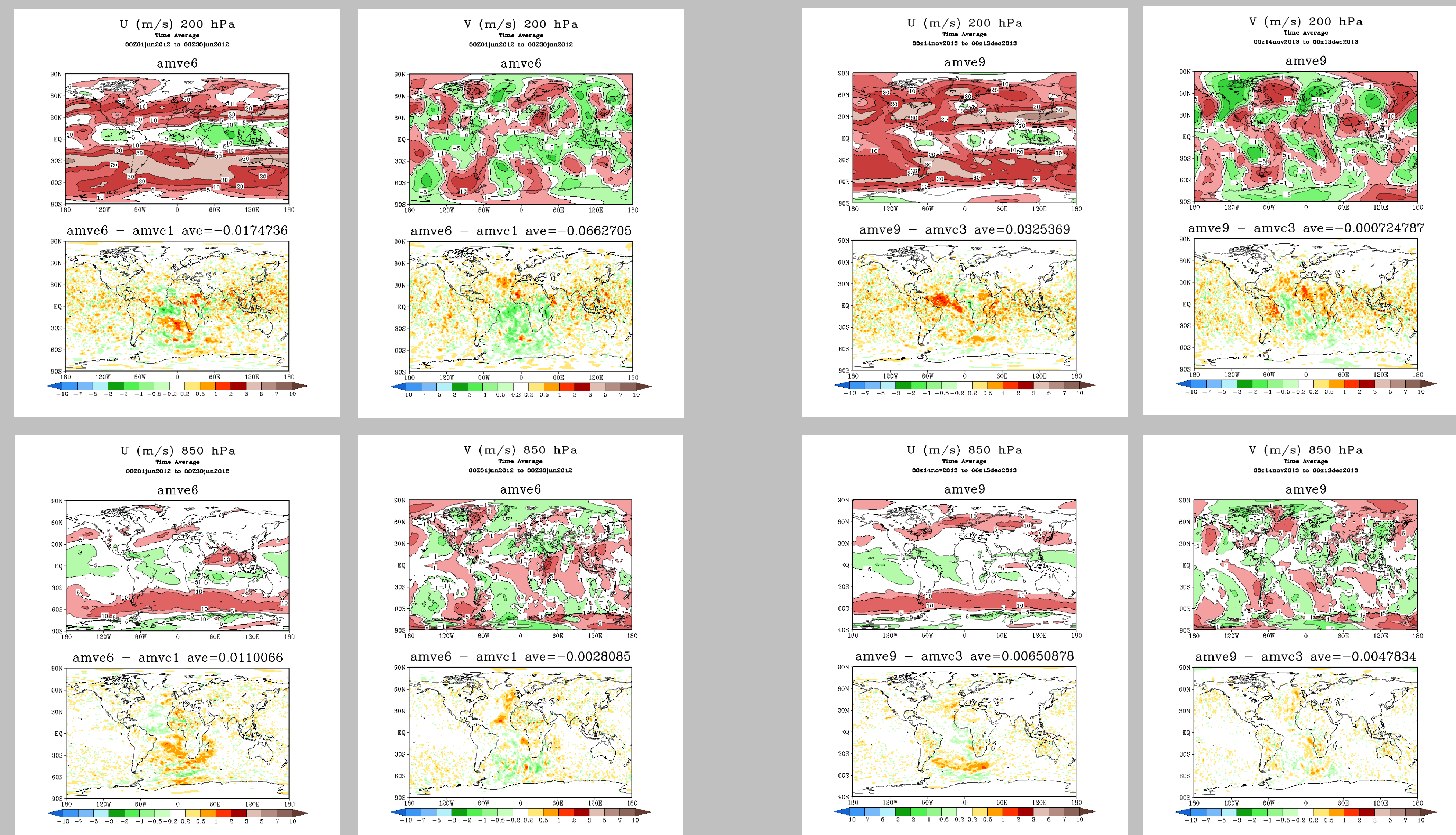
Using Meteosat-9 & 10 SEVIRI imagery, proxy data have been created with the new GOES-R ABI Nested Tracking Algorithm. 4 AMV types have been processed to represent ABI Channel 2 (visible, VIS), 7 (near infrared, NIR), 8 (cloud top water vapor, CTWV), and 14 (infrared, IR). CTWV height is determined from the cluster brightness temperature linearly interpolated to a height using the forecast GFS temperature while the other AMV types have heights which are based on the GOES-R ABI cloud height algorithm. Assimilating this proxy data within the GFS allows:

1. Collection of departure statistics to determine quality control procedures
2. Evaluation of the specification of the observation error in the Gridpoint Statistical Interpolation (GSI)
3. Analysis of the AMV impact on the GFS analysis state and forecast skill

GFS results are shown for June 2012 using 6-hourly GOES-R AMVs, experiment AMVE6, and Nov-Dec 2013 using 1-hourly GOES-R AMVs, experiment AMVE9. This work is funded by the GOES-R Risk Reduction Program.

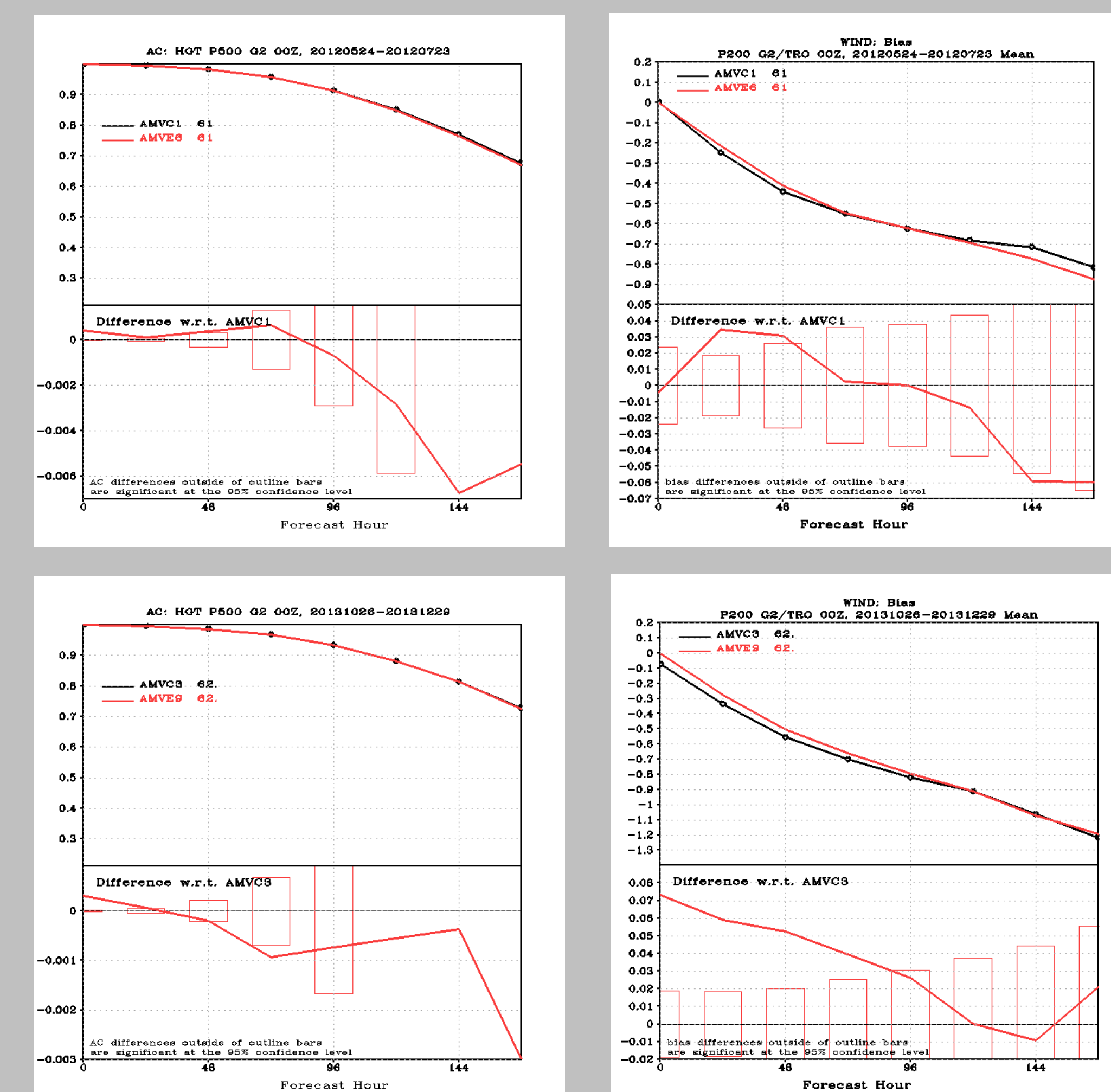
## Impact on Analysis Circulation

The U and V wind components are shown below for the experiments, AMVE6 & AMVE9, which included the GOES-R AMVs as well as the difference in the fields compared to the control runs, AMVC1 & AMVC3, which did not use AMVs from SEVIRI.



## Impact on Forecast Skill

Neutral to slightly positive impact on forecast skill. Experiment AMVE6 & AMVE9 with GOES-R AMVs are compared to the controls, AMVC1 & AMVC3, which did not use AMVs from SEVIRI. Anomaly height correlation at 500 hPa shows neutral global impact (left). Tropical 200 hPa vector wind bias is slightly reduced for the experiments at shorter forecast lengths (center). Analysis vector wind fit to radiosondes is not degraded (not shown).



## Departure Statistics

Mean speed bias as function of pressure is shown below for the AMV-GFS Background (dashed) and AMV-GFS Analysis (solid). The vector difference RMSE is plotted as well (right set of lines). Color indicates AMV type.

